EXAMINATIONS COUNCIL OF ESWATINI
Eswatini General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER							CANDIDATE NUMBER					

PHYSICAL SCIENCE **6888/03**

Paper 3 Practical Test **October/November 2024**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional materials: As listed in confidential instructions.

READ THESE INSTRUCTIONS FIRST

Write your name, centre number and candidate number in spaces provided.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Do **not** use staples, paper clips, highlighters, glue or correction fluid.
Do **not** write on the bar code.

Answer **all** questions.

You may use an electronic calculator.
You may lose marks if you do not show your working or if you do not use appropriate units.

The number of marks is given in brackets [ ] at the end of each question or part question.
Chemistry practical notes for this paper are printed on page 11.

For Examiner's Use	
1	
2	
Total	

This document consists of **11** printed pages and **1** blank page.

1 You are going to investigate the reaction of zinc metal and aqueous copper(II) sulfate.

You are provided with zinc granules, a thermometer and a polystyrene cup containing 50 cm^3 aqueous copper(II) sulfate.

(a)

- Insert the thermometer into the polystyrene cup containing aqueous copper(II) sulfate, as shown in Fig. 1.1.
- Measure the temperature of the aqueous copper(II) sulfate.

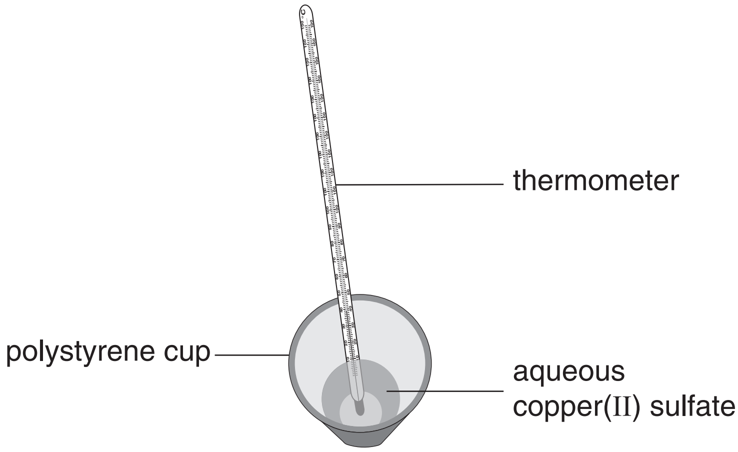

Fig. 1.1

Record the value as the initial temperature.

Initial temperature, T_0 .... °C [1]

(b)

- Place the zinc granules into the polystyrene cup containing aqueous copper(II) sulfate, as shown in Fig. 1.2, and at the same time start the stopwatch.

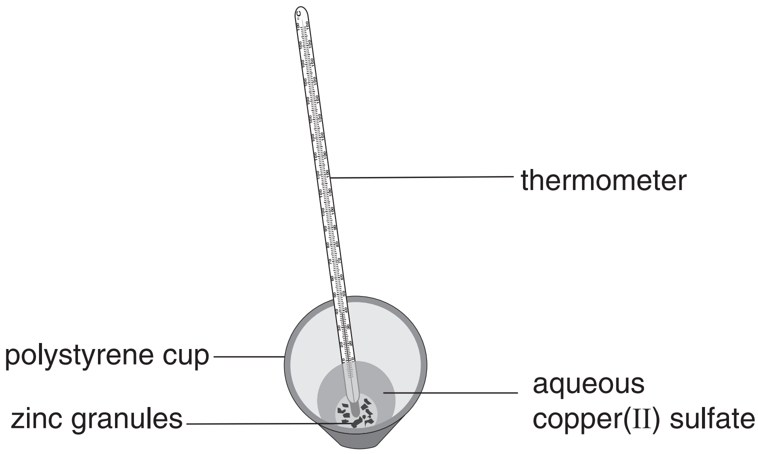

Fig. 1.2

- Stir the contents of the polystyrene cup, using the thermometer.
  Precaution: *stir gently to avoid breaking the bulb of the thermometer.*

For Examiner's Use

(i) Measure the temperature, T, of the contents at 60 second intervals for 480 seconds.

Record the results in Table 1.1. [1]

(ii) Calculate the temperature change, ΔT, for all the times in Table 1.1.

Use the formula: $\Delta T = T - T_0$

Record the temperature change in Table 1.1. [2]

Table 1.1

time / s	60	120	180	240	300	360	420	480
temperature, T / °C								
temperature change, ΔT / °C								

[Keep the contents of the polystyrene cup for later use.]

(iii) Explain, using collision theory, why you continuously stirred the contents of the polystyrene cup.

....

....

.... [2]

(c) (i) State whether the reaction occurring in the polystyrene cup is endothermic or exothermic.

Justify your choice with reference to your results in Table 1.1.

reaction ....

justification ....

....

....
[2]

(ii) Explain why it is better to use a polystyrene cup than a beaker to carry out the experiment.

....

....

.... [2]

(iii) Suggest a modification to the polystyrene cup that could improve the accuracy of the results.

....

.... [1]

Use the solution kept in the polystyrene cup for this section.

(d)

- Set up the filtration apparatus as shown in Fig. 1.3.
- Filter the contents in the polystyrene cup.
- Observe the residue on the filter paper.

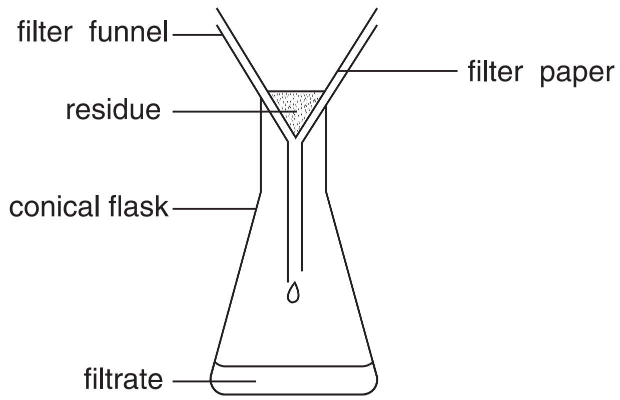

Fig. 1.3

(i) Describe your observation and suggest the name of the new substance formed in the residue.

observation ....

name of new substance in residue ....
[2]

(ii) Name the type of reaction that has occurred between the copper(II) sulfate and zinc metal.

.... [1]

(e) Suggest and explain an additional observation you can make about the solution inside the polystyrene cup if the zinc granules were left in the solution for 30 minutes.

observation ....

explanation ....
[2]

For Examiner's Use

(f)

- Place 5 cm^3 of the filtrate into a test-tube.
- Add a few drops of nitric acid.
- Add a few drops of barium nitrate solution.

(i) State and explain your observation.

....

.... [2]

(ii) A student places an aluminium rod into your remaining filtrate and leaves for 30 minutes.

The student observed no change.

Explain this observation.

....

....

.... [2]

[Total: 20]

2 In this experiment you are going to determine the upward force exerted by water on a test-tube.

- You are provided with a test-tube marked into equal divisions.
- The marks are labelled 1 to 5 starting from the bottom of the test-tube.
- A string is tied to a map pin and the pin is pushed into the stopper.
- The test-tube is fitted with the stopper as shown in Fig. 2.1.

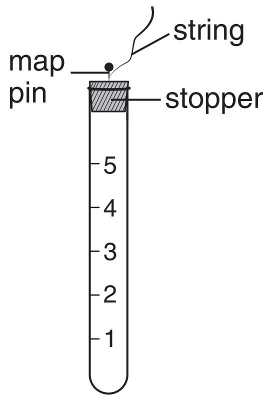

Fig. 2.1

(a) You are going to determine the mass of water in a test-tube.

- Measure the weight of the empty test-tube + stopper using a spring balance as shown in Fig. 2.2.

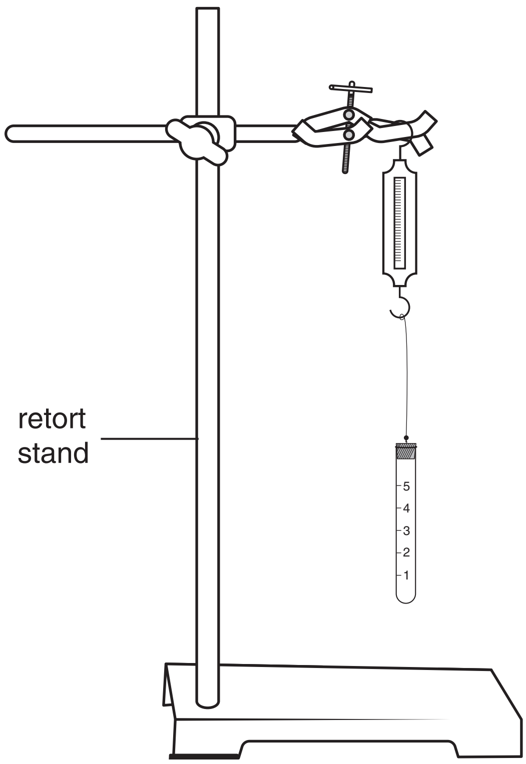

Fig. 2.2

(i) Record the weight of the empty test-tube + stopper as 'W_1'.

W_1 .... N [1]

(ii)

- Pour water into the test-tube up to the second mark.

- Measure the weight of the test-tube with the water + stopper, using the spring balance.

  Record the weight of the test-tube with the water + stopper as 'W_2'.

W_2 .... N [1]

(iii) Calculate the weight, W, of the water in the test-tube using the results you obtained in **(i)** and **(ii)**.

W .... N [2]

(iv) Calculate the mass, m, of water in the test-tube.

Use the formula:

$W = mg$

[Take $g = 10\,N/kg$]

Record this mass in Table 2.1.

[2]

For Examiner's Use

(v) You are now going to determine the mass of water for three other divisions, 1, 3 and 4, by completing 3 more experiments.

Repeat steps **(ii)**, **(iii)** and **(iv)** for each division. You will need to pour water up to the correct division mark each time in step **(ii)**.

Record your calculated masses in Table 2.1.

[2]

Table 2.1

division mark on test-tube	mass of water / kg	W_3 / N	upward force of water / N
1			
2			
3			
4			

(b) You are going to determine the weight of the test-tube containing water up to division mark 2 as it is lowered into water.

- Suspend the test-tube with water up to division mark 2 on the spring balance.
- Pour water into a measuring cylinder up to about three quarters full.
- Lower the test-tube into the measuring cylinder with water up to the first mark, as shown in Fig. 2.3.

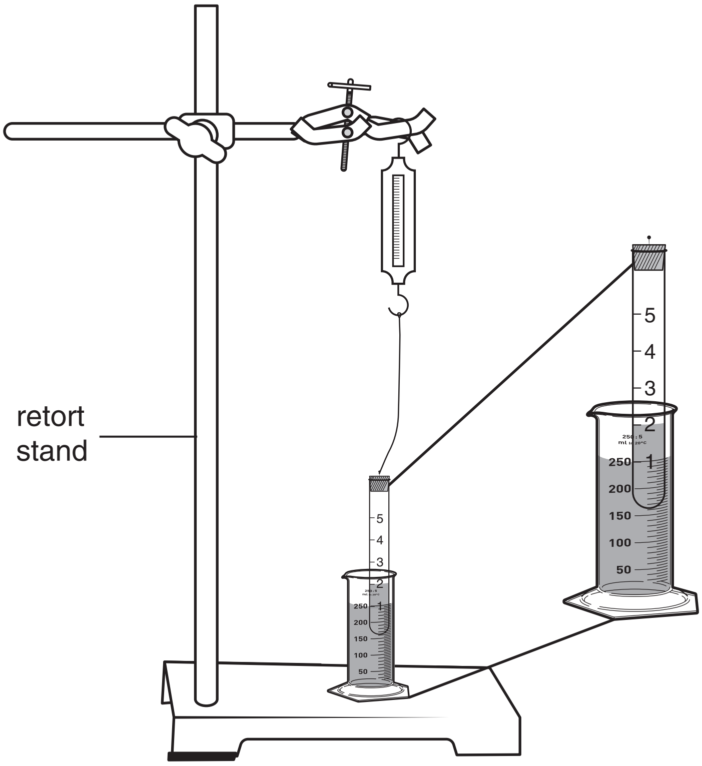

Fig. 2.3

(i) Record the weight in column 3 of Table 2.1 as W_3. [1]

(ii) Repeat step **(b)** with all the other markings on the test-tube.

Record your results in Table 2.1. [1]

(iii) Suggest why there is no reading after the fourth division.

....

.... [1]

(c) Calculate the upward force of water on the test-tube at the different markings by using the formula:

upward force of water $= W_2 - W_3$

Record your calculated values of upward force of water in Table 2.1. [2]

(d) Using the results in Table 2.1, state what happens to the weight of the test-tube as it is lowered into the water in the measuring cylinder.

....

.... [1]

(e) Plot a graph of upward force of water against the division mark on the test-tube, using the results in Table 2.1.

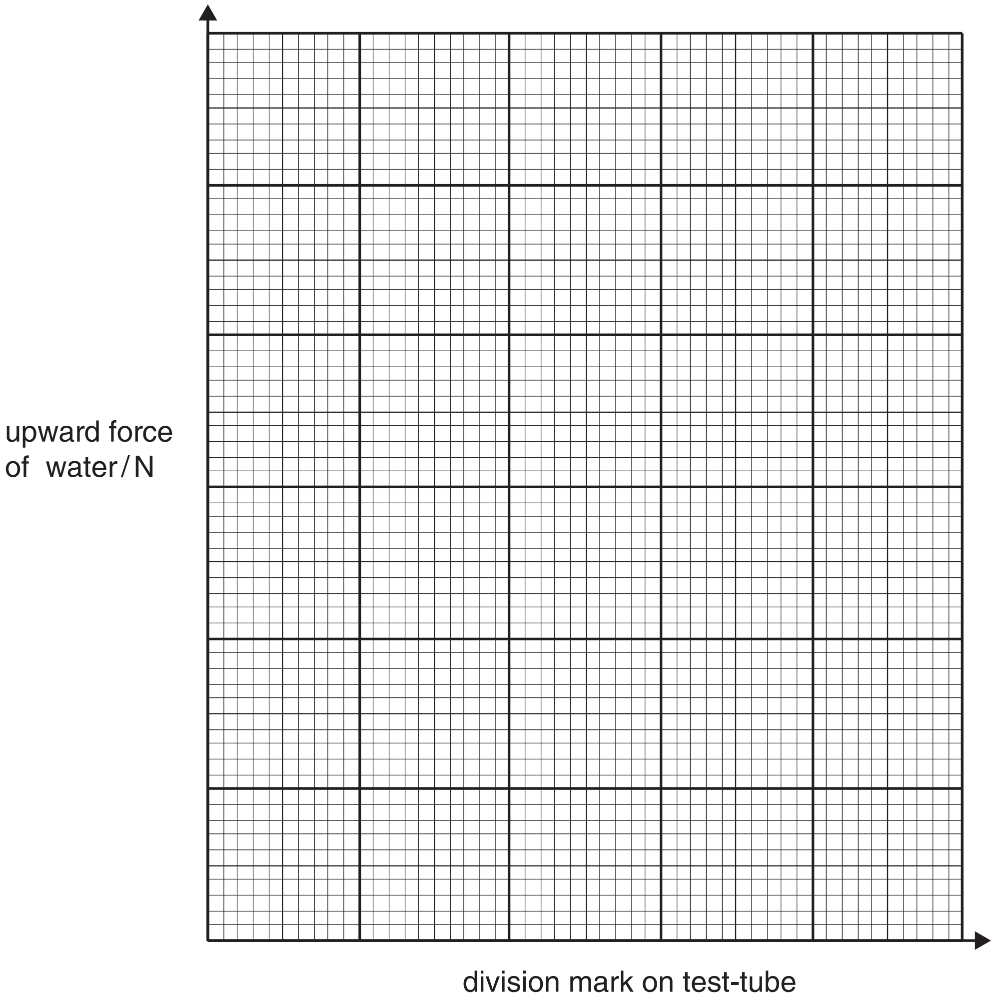

Fig. 2.4

[4]

(f) Calculate the gradient of the graph in Fig. 2.4.

gradient .... [2]

[Total: 20]

CHEMISTRY PRACTICAL NOTES

Tests for anions

Anion	*Test*	*Test result*
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
Iodide(I^-) [in solution]	acidify with dilute nitric acid, and then add aqueous lead(II) nitrate / aqueous silver nitrate	yellow ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt.

Tests for aqueous cations

Cation	*Effect of aqueous sodium hydroxide*	*Effect of aqueous ammonia*
ammonium (NH_4^+)	ammonia produced on warming	no reaction
Calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt or very slightly white ppt.
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

Tests for gases

gas	*test and test results*
ammonia (NH_3)	turns damp litmus paper blue
carbon dioxide (CO_2)	turns limewater milky or white
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	'pops' with a lighted splint
oxygen (O_2)	relights a glowing splint

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